Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SMP09-06 Room:201A Time:May 27 11:30-11:45

Insights from zircon chronology and chemistry constraints into Neoproterozoic orogens at Sor Rondane, East Antarctica

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Zircon chronology combined with its mineral chemistry is key tools for evaluating the temporal evolution of metamorphic processes. Assembly of Gondwana supercontinent has been argued in numerous studies. Generally the reported ages of Gondwana collision zones are in the range of 750-500 Ma (e.g., Meert, 2003; Jacobs et al., 2003; Grantham et al., 2003). From East Antarctica, a number of Neoproterozoic to Cambrian high-grade metamorphic terranes are distributed, and pervasive 550-500 Ma metamorphic ages have been reported from most of these terranes (e.g., Fitzsimons, 2000; Harley, 2003; Shiraishi et al., 2003) with minor >600-550 Ma ages (Shiraishi et al., 2008; Dunkley et al., 2014; Hokada and Motoyoshi, 2006).

Sor Rondane Mountains is one such area where older c.640-600 Ma high-grade metamorphic rocks along with pervasive 550-500 Ma age events have been reported (e.g., Shiraishi et al., 2008; Osanai et al., 2013; Adachi et al., 2013; Hokada et al., 2013). Hokada et al. (2013) discussed based on the zircon and monazite U-Th-Pb and REE analyses by using ion microprobe and electron microprobe applying to garnet-biotite-sillimanite gneiss and associated multiple generations of leucocratic veins in the central part of Sor Rondane Mountains, and suggested multiple (at least three stages of) metamorphic and fluid (intrusion of leucocratic vein) events at >700 Ma, 640-630 Ma and 550-520 Ma with main granulite-facies event at c.637+/-6 Ma. Combined with the other available and newly obtained age data, temporal processes of possible geologic events recorded in Sor Rondane Mountains and their implications for supercontinent evolution of Gondwana during c.700-550 Ma will be discussed.

Keywords: Gondwana supercontinent, zircon U-Pb age, rare earth elements, high-grade metamorphism, East Antarctica, Sor Rondane Mountains